Initial TAMDAR Datalink Concept Flights

WxAP Annual Review

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Introduction

In order for TAMDAR data to be the most effective, it should be datalinked off the aircraft in a timely manner.

To test the initial concept of transmitting TAMDAR information off an aircraft, two systems were evaluated by WINCOMM.

Satellite based
- Echoflight

Air-to-Ground / Air-to-Air
- UAT

Introduction

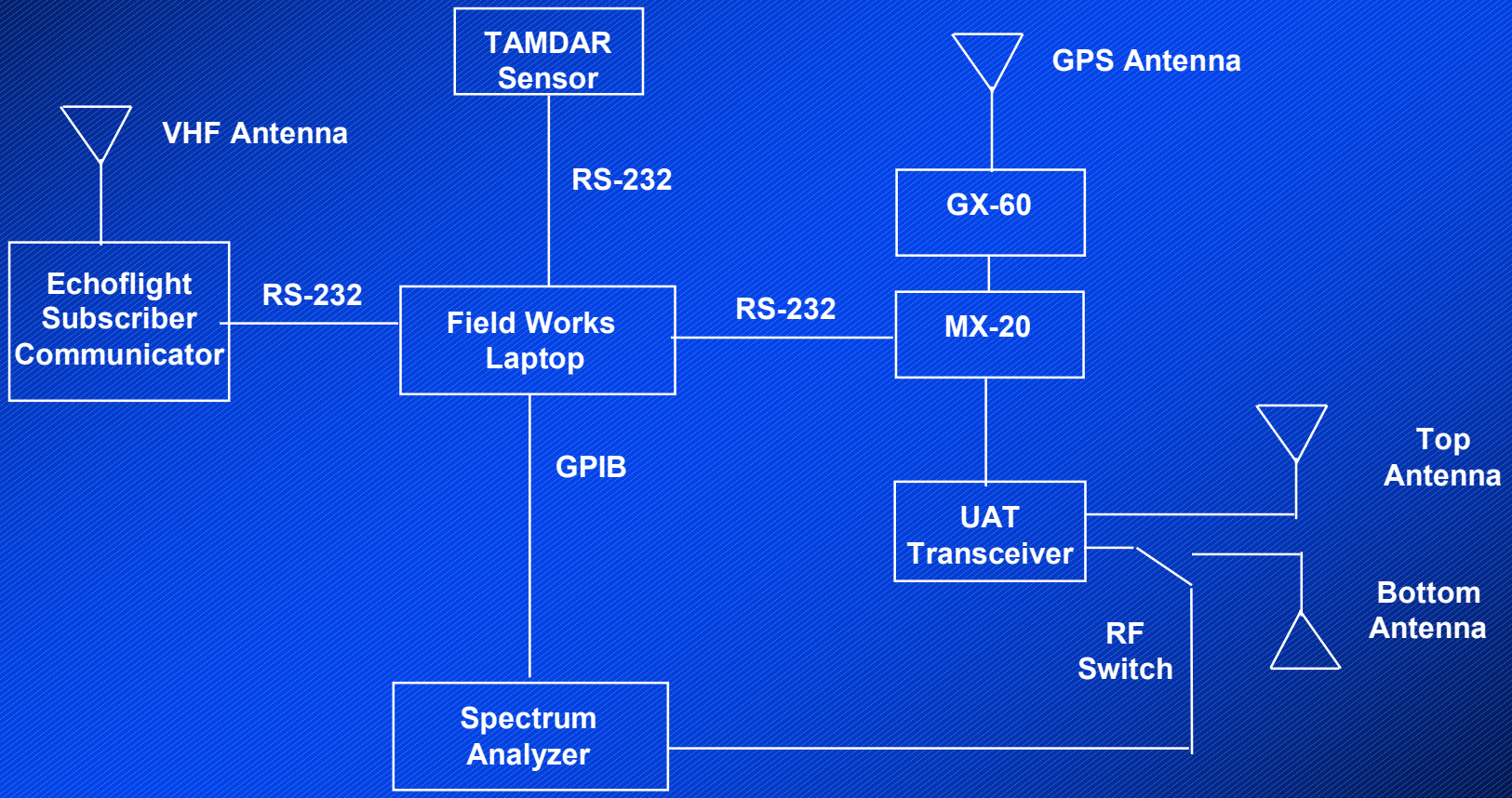
To provide data for transmission off the aircraft, a TAMDAR sensor was mounted on NASA GRC's Twin Otter.

A series of arcs were flown at different altitudes and ranges from a ground station installed at the Mansfield, OH airport (MFD).

TAMDAR Sensor

Twin Otter

System Diagram



Flight Equipment

Field Works Laptop

MX-20, GX-60

Echoflight
Subscriber Communicator
Spectrum Analyzer

Introduction

The TAMDAR sensor was polled for all data at a 3.2 second interval.

A portion of the sensor data was encoded in a 30 ASCII character string for transmission.

- -The data was not encoded in a standards based format, due to ongoing changes in formatting at the time of the flights.
- -The formatting of weather sensor data is being worked in the Architectures and Requirements element of WINCOMM.

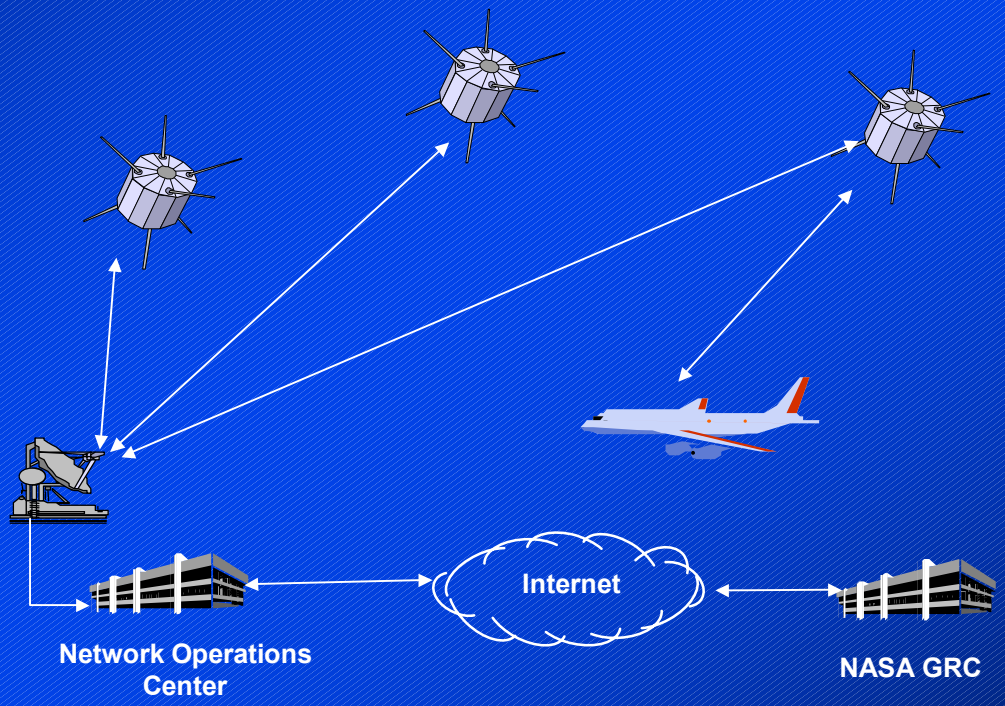
Echoflight Overview

The Echoflight system utilizes the Orbcomm satellite system, which is in a Low Earth Orbit (LEO)

A standard aircraft VHF antenna, used for all communication to and from the Orbcomm system, was mounted on the upper portion of NASA GRC's Twin Otter.

Echoflight Overview

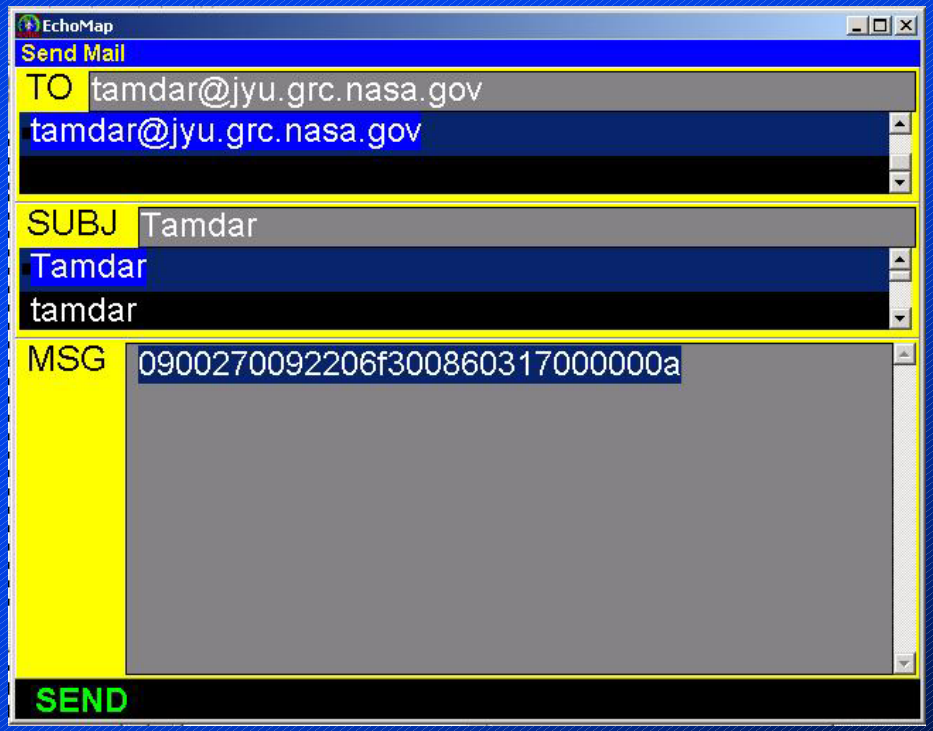
The Orbcomm system relays messages transmitted from the aircraft to a Network Operations Center for delivery via the Internet.



Echoflight Overview

The testing utilized a WINCOMM developed scripting interface to the off-the-shelf Echomap software in order to send the TAMDAR data as email messages.

The messages were queued once per minute. The messages were transmitted in a First-In-First-Out order, whenever a satellite was in view.



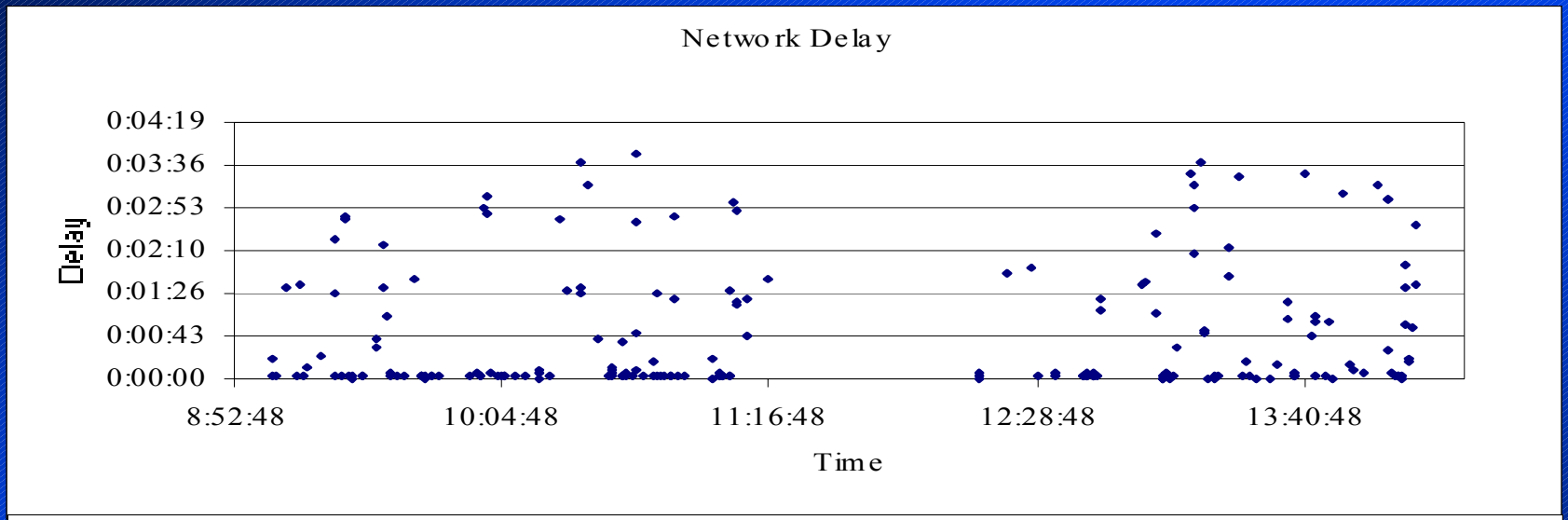
Echoflight Data

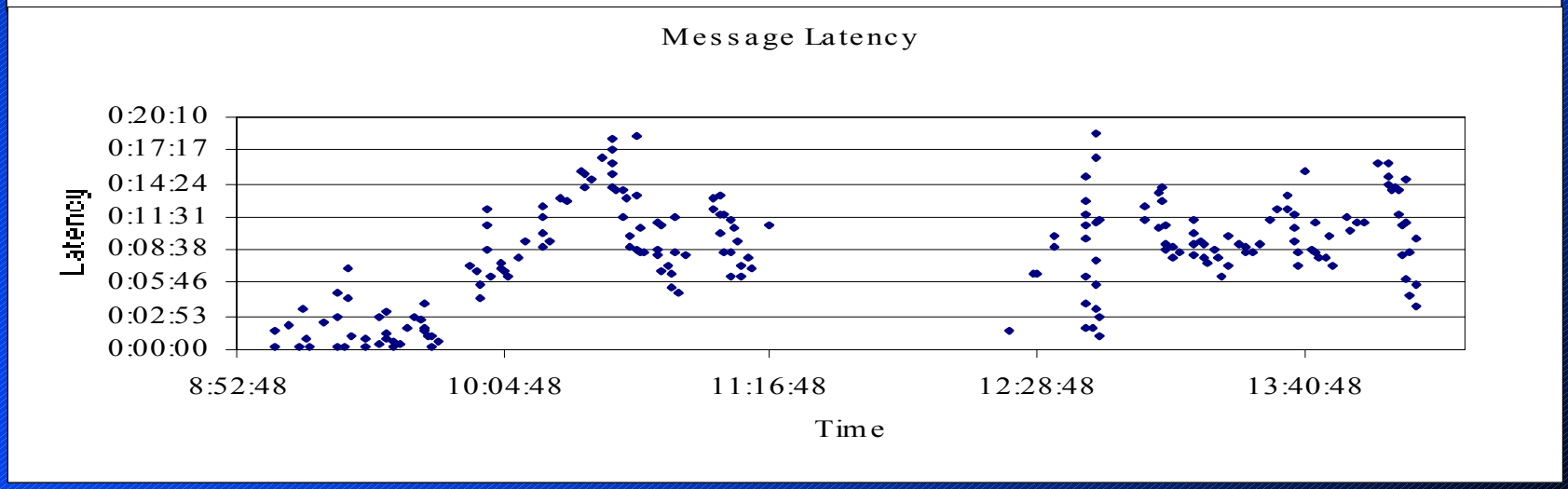
TAMDAR messages were transmitted over the Echoflight system on two flights, the first flight was 2 hours and the second flight was for 4 hours.

During this six hour testing period, only five messages were lost.

	Duration	Average Message Latencey	Average Network Delay
Flight 1	2:10:05	0:22:08	0:00:03
Flight 2	4:00:35	0:08:30	0:00:44

Echoflight Data

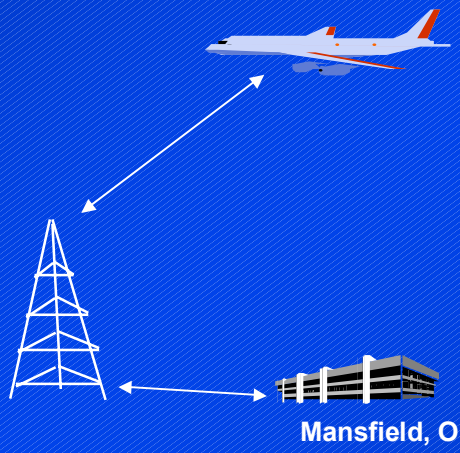




UAT Overview

The UAT system was an off the shelf Capstone system at 966MHz.

Testing utilized a serial interface to the UPSAT MX-20. The MX-20 software was modified to send an extended ADS-B message with a 30 character TAMDAR message.



UAT Transceiver

UAT Overview

TAMDAR messages were sent to the MX-20 every 3.2 seconds, for transmission.

UAT Data

TAMDAR messages were transmitted over the UAT system during two 1 ½ hour flights.

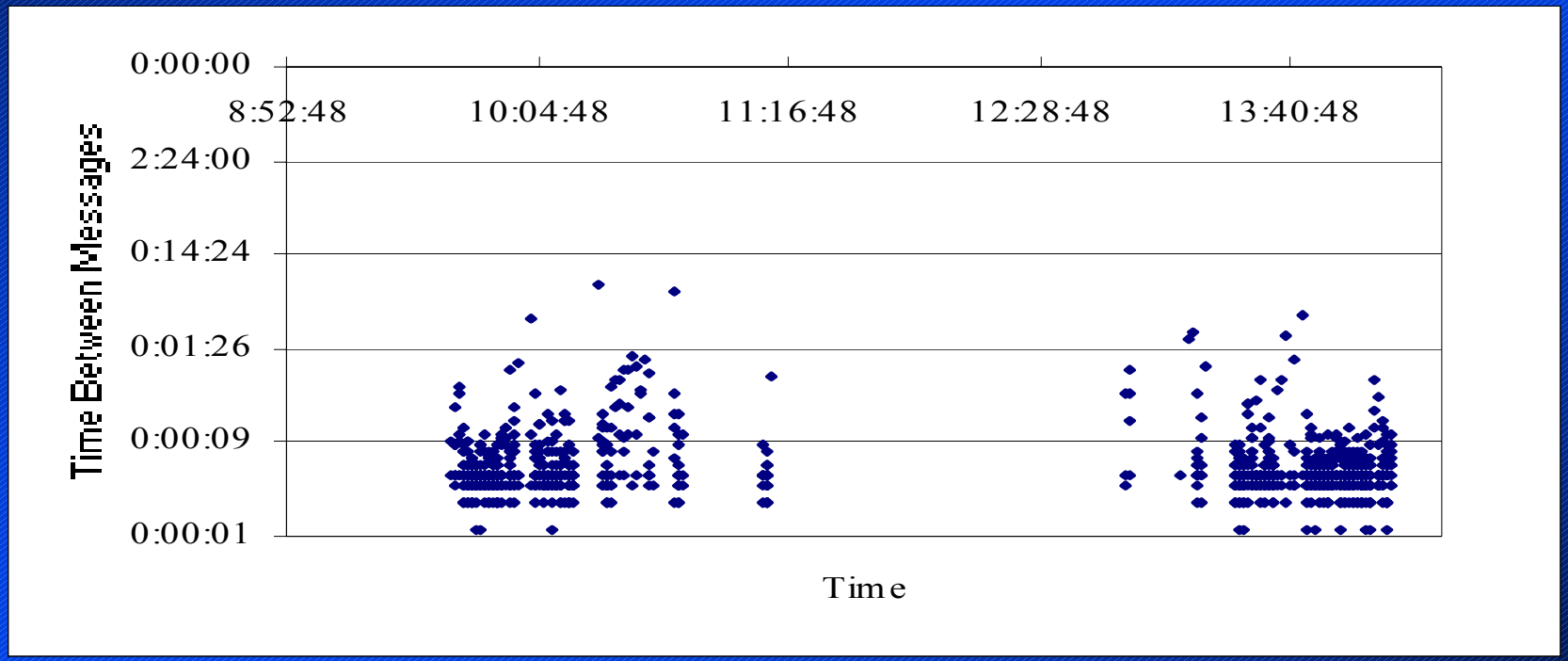
Approximately 3400 TAMDAR messages were transmitted and 1000 messages were received at the ground station.

Messages were lost due to the attitude of the aircraft, out-of-range of the transmitter, and not in line-of-sight of the transmitter.

1/25/2002 Flight Track

Each yellow dot represents a TAMDAR message received at the ground station.

UAT Data


0:00:00
2:24:00
0:14:24
0:01:26
0:00:09
0:00:01
Time Between Messages
8:52:48
10:04:48
11:16:48
12:28:48
13:40:48
Time

TAMDAR Data

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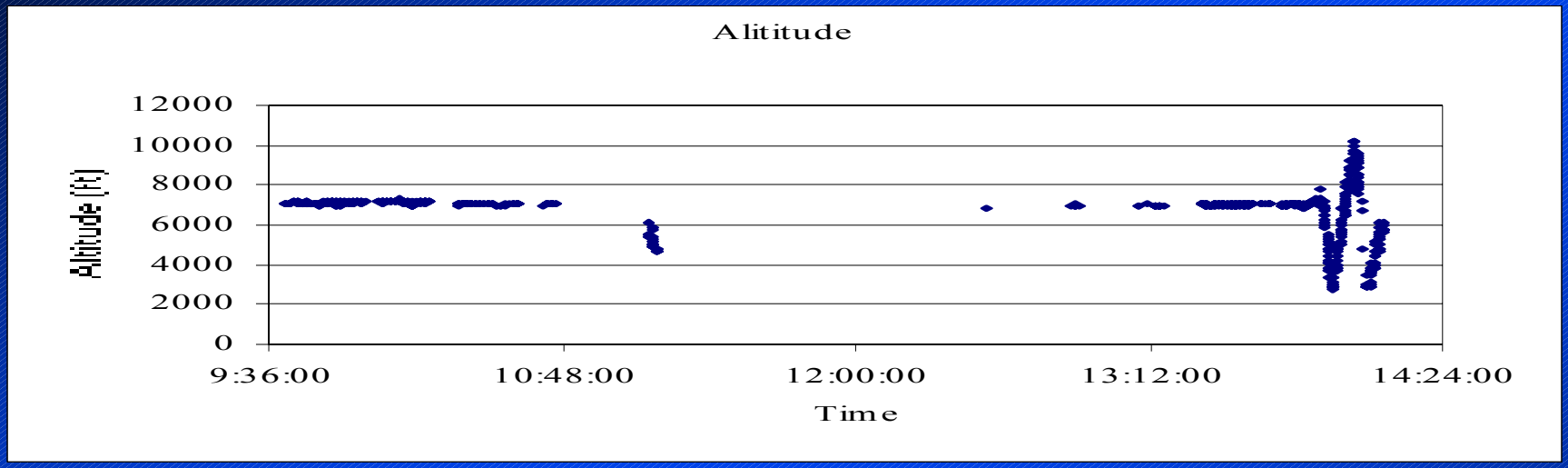

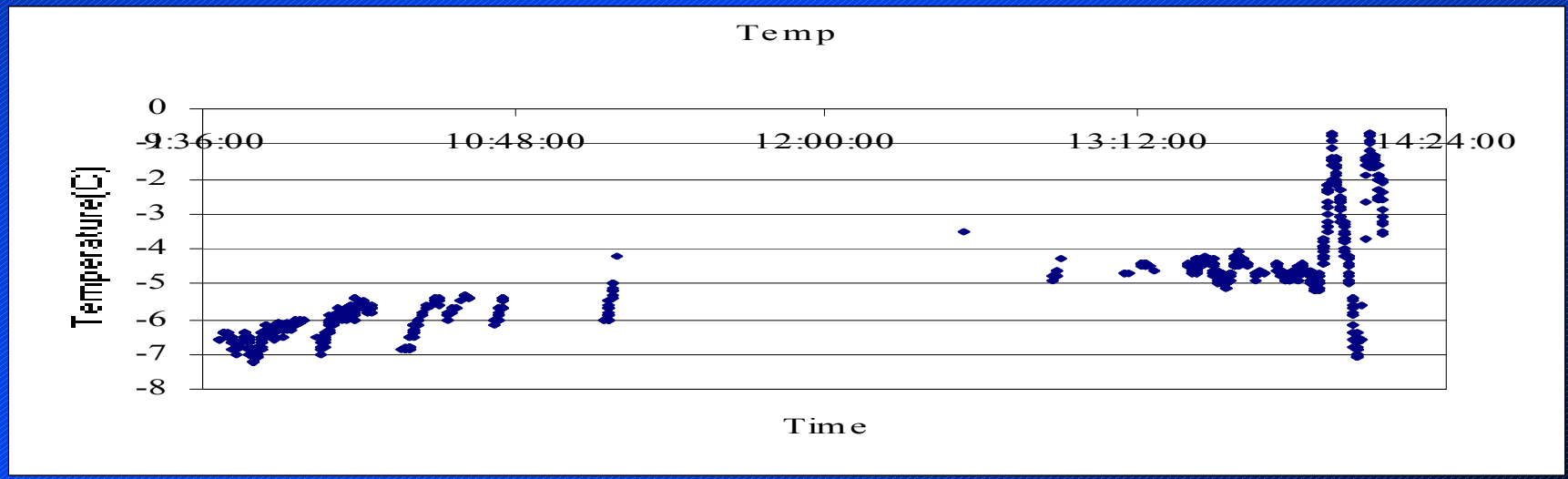

TAMDAR Data

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